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I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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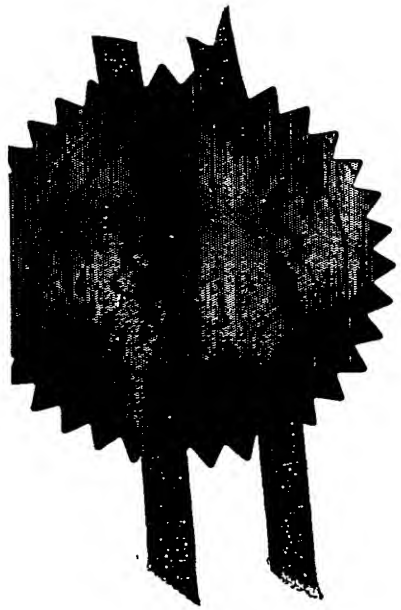

Signed

Dated 8 December 2004

Patents Form 1/77

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P01/7700 0.00-0328564.0

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
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NP10 8QQ

1. Your reference — 04.1505.4-mo.

2. Patent application number *(The Patent Office will fill this part in)* — 0328564.0

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

STEPHEN TERENCE DUNNE
THE COTTAGE
ST. FINBOROUGH
STOWMARKET
IP14 3AE

Patents ADP number *(if you know it)* 6195293004

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention — VARIABLE FLOW DISCHARGE METERED DOSE VALVE

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

ALPHA & OMEGA
LIME CROFT, EAST HILL,
OTTERY ST. MARY,
DEVON,
EX11 1RJ.

Patents ADP number *(if you know it)* 41899004

PFS/77
1/12/04

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application	Date of filing *(day / month / year)*

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form	
Description	4
Claim(s)	0
Abstract	0
Drawing(s)	6 & 6

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	
Request for a preliminary examination and search (Patents Form 9/77)	
Request for a substantive examination (Patents Form 10/77)	
Any other documents (please specify)	

11. I/We request the grant of a patent on the basis of this application.

Signature(s) S.T. Dunne Date 7/12/2003

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

S.T. DUNNE
01449 612888

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.

b) Write your answers in capital letters using black ink or you may type them.

c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered YES in part 8, a Patents Form 7/77 will need to be filed.

e) Once you have filled in the form you must remember to sign and date it.

f) Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.

Variable Flow Discharge Metered Dose Valve

Background

This Invention is concerned with Metered Dose Valves for use with pressurised aerosol packs where a liquid product is pressurised by a liquefied or compressed gas or a solid product suspended in a liquefied gas but is not limited to such packs.

Many pressurised aerosol packs contain a metered dose valve which accurately measures a single dose of the product within the pressurised reservoir. Such valves are used in many applications including for example for delivering accurate amounts of drug to a patient or animal. Generally the valve dispenses the total dose when it is opened with the user having no control over how much of the metered dose is delivered. In most cases this is an important aspect of the valve as for instance in the case of medical inhalers it is important the patient receives no less or no more of the metered dose. Generally such valves are operated by depressing an actuator with finger pressure with the movement stopping only when the open position is reached. The valve is generally spring loaded so that it returns to the closed position when finger pressure is released.

When such valves are actuated by the user the user in only aware of two positions; closed and open or (a) and (c). On the way from position (a) to (c) and vice versa position (b) is reached but the user has no knowledge of this. The majority of such valves have within two separate valves, usually containing cut gaskets. The inlet valve connects the canister liquid reservoir to the metering chamber while the outlet valve connects the metering chamber to the atmosphere. The two positions that the user is aware of are position (a) or closed valve where the inlet valve is open and the outlet valve is closed and position (c) or open valve where the inlet valve is closed and the outlet valve is open. When in position (a) the metering chamber is maintained full of liquid product and sealed from the atmosphere and when in position (c) the contents are allowed to flow into the atmosphere while the metering chamber is sealed from the liquid pressurised canister or reservoir.

What the user is unaware of is that there is an intermediate position (b) where both the inlet valve and the outlet valves are closed. This is because to accurately meter the product the inlet valve must be closed before the outlet valve is opened.

In some applications it is advantageous for the user to discharge the total contents of the metering chamber in more than one action. In the present invention position (b) can be selected by the user allowing the user to select position (c) more than once before the total contents of the metering chamber are discharged.

Description of the Invention.

In the present Invention a conventional metered dose valve consisting of an inlet valve and an outlet valve has an additional mechanism that allows the user to select three positions:

(a) Closed valve where the inlet valve is open and the outlet valve closed.

(b) Ready to use valve where both inlet and outlet valves are closed.

(c) Open valve where the inlet valve is closed and the outlet valve is open where:

While in position (a) position (c) cannot be selected. While in position (b) position (c) can be selected.

The additional mechanism may be located within the valve body or outside the valve body.

Position (b) may be reached from position (a) by twisting an actuator. Position (c) may be reached from position (b) by depressing an actuator.

The inlet and outlet valves may be of the cut gasket type with cross apertures or orifices. When the valve is mounted and crimped on a canister using an 1" or 20mm state of the art cup the mechanism may be located on said cup.

The contents of the canister or reservoir may be pressurised by a liquefied gas or a compressed gas or a biased means or any other means. The liquid contents may be stored in a bag within the canister pressurised by gas in the canister or gas in the canister and bag.

The valve may be used with a dip tube or used in the inverted position without a dip tube. The metering chamber may be of any volume but at least twice the volume of the canister contents. The canister may be of any volume.

The discharge from the valve may be in the form of a liquid stream, jet, spray, foam or solid particles or any other form.

Figures

Figures 1 to 6 further describe the invention. Figures 1 to 3 describe a typical state of the art metered dose valve while Figures 4 to 6 show one embodiment of the invention. In Figure 4 to 6 a rotating locking mechanism is shown outside the valve body. Other embodiments are possible but not shown. For example the rotating locking mechanism may be mounted within the valve body.

In Figure 1 a state of the art metered dose valve is shown in the closed position or position (a). A stem 101 has channel 102 within connecting to an aperture 103 and a

channel 104 connecting to an aperture 105. An inlet valve is formed by the aperture 103 and a gasket 106 and on the Figure the valve is in the open position connecting the aperture 103 with the metering chamber 107. The outlet valve is formed by orifice 105 and gasket 108 and in the Figure is shown in the closed position. The stem is mounted in the usual way by a metal cup 109 which is mounted on a canister 110 holding a pressurised liquid. The stem is biased towards the closed position by spring 111. In the position shown liquid from the canister 110 enters the metering chamber 107 via aperture 103 ensuring said chamber is always full of liquid product. In the vertical position shown a dip tube must be connected to the stem 101 to connect to channel 102 or the valve may be inverted and used without a dip tube. Alternatively for any orientation use a bag on valve, a bag in can or a piston in can may be used.

In Figure 2 the intermediate position (b) is shown which is reached when the user depresses stem 101. The user of the state of the art valve is not aware of this position. Both the inlet valve formed by gasket 106 and the outlet valve formed by gasket 108 are in the closed position isolating the contents of metering chamber 107 from both the canister and the atmosphere.

In Figure 3 the open position (c) is shown. This position is reached by further pressure from the user on stem 101. In this position the inlet valve formed by gasket 106 is closed while the outlet valve formed by gasket 108 is open allowing the contents of the metering chamber 107 to be discharged to the atmosphere via aperture 103, channel 104 and exit 114.

When the user releases the pressure on stem 101 the biased means 111 returns the valve return to the closed position (a) via position (b).

In Figures 4 to 6 the same metering valve as that shown in Figures 1 to 3 is shown with the addition of a locking mechanism.

In Figure 4 an embodiment of the invention is shown and the valve is shown in the same closed position (a) as in Figure 1. An actuator 150 is mounted on stem 101. A locking body 152 is mounted in a rigid position on the mounted cup 109 and fixed at position 153. The actuator 150 has a locating pin 155 and the locking body has a recess 156 and a groove 157. A shoulder 108 prevents the valve reaching position (b) or (c). To reach position (b) the actuator 150 is depressed by the user and rotated by 90 degrees.

Position (b) is shown in Figure 5 where both the inlet and outlet valves formed respectively by gaskets 106 and 108 are closed. Shoulder 159 prevents the valve returning to position (a). This is to ensure no more product can enter the metering chamber 107 before all its contents are dispensed.

Once in position (b) shown in Figure 5 the user can reach position (c) shown in Figure 6 by further depressing actuator 150 opening outlet valve formed by gasket 108 releasing the some or all of the contents of the metering chamber 107. When the user releases the pressure on actuator 150 the valve returns to position (b) shown in Figure 5. In position (b) the inlet valve formed by gasket 106 is closed so that no more liquid can enter the metering chamber 107. By retuning to position (c) shown in Figure 6 as

many times as it takes to empty the metering chamber 107 the user has full control over discharging the contents of the metering chamber 107.

To refill the metering chamber the user counter rotates the actuator 150 allowing the spring 111 to return the stem 101 to position (a) shown in Figure 4. In position (a) the inlet valve formed by gasket 5 is open allowing liquid from the canister to enter said chamber 107.

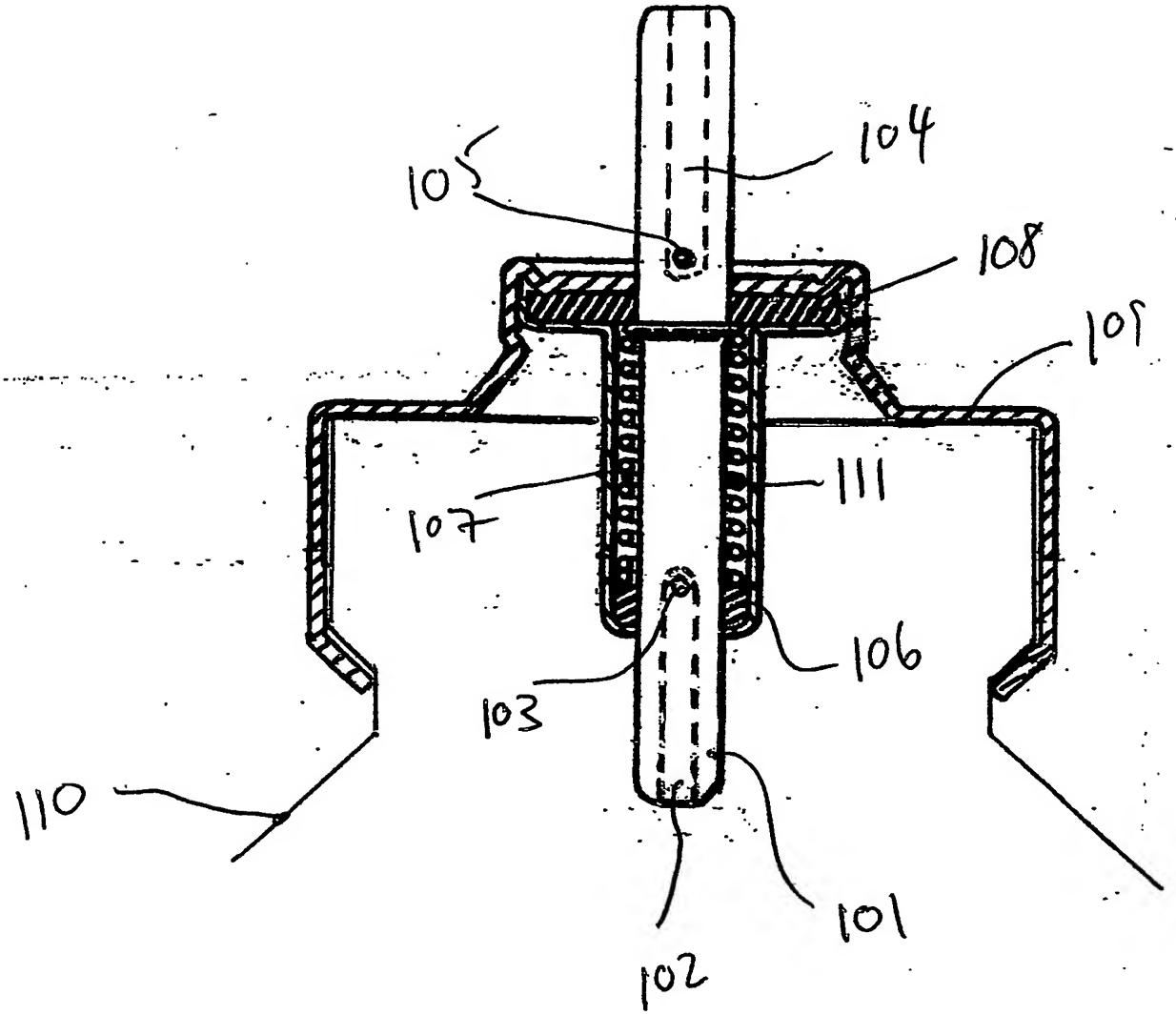

Fig. 1

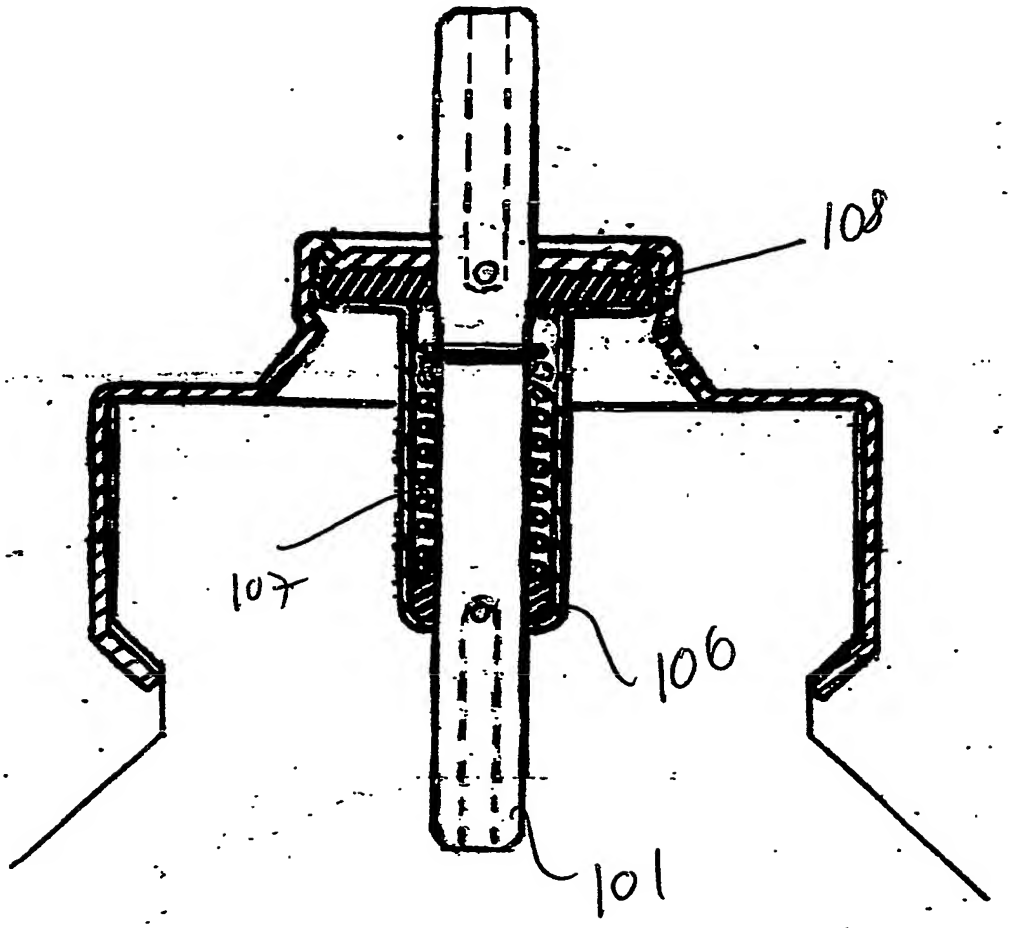

Fig 2

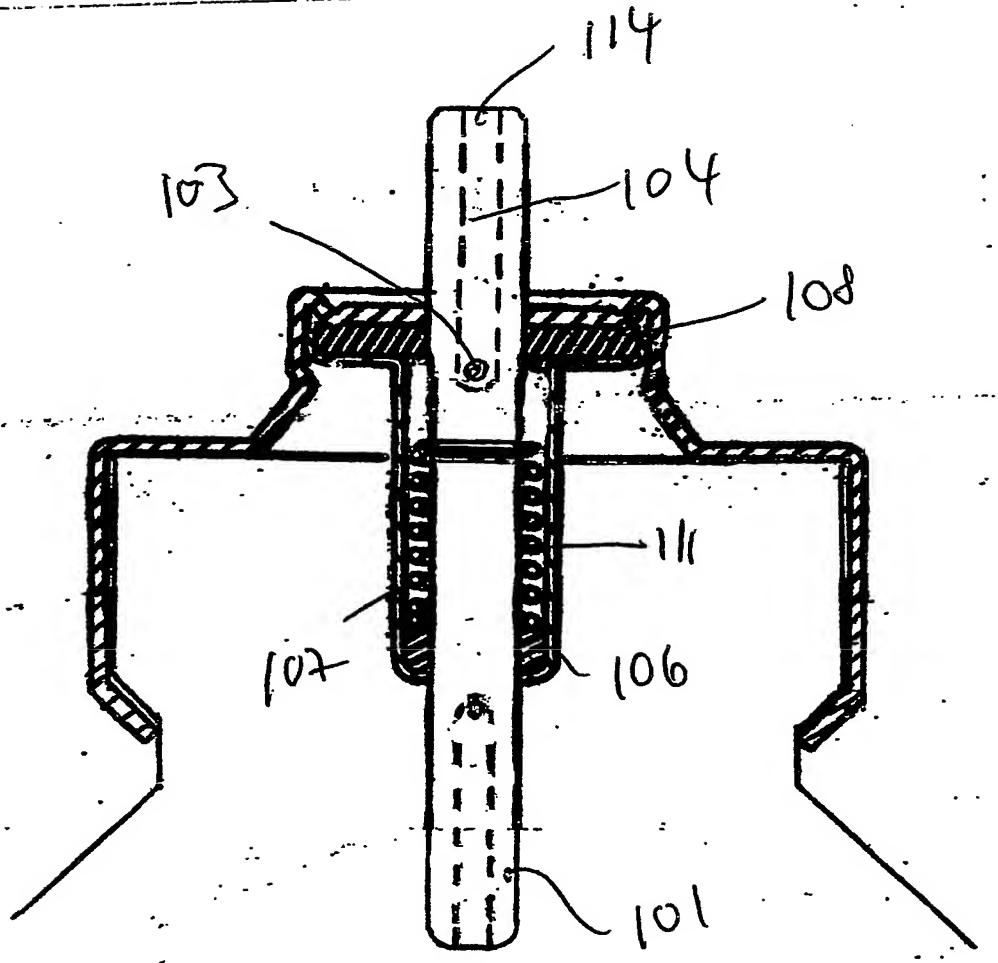

Fig. 3

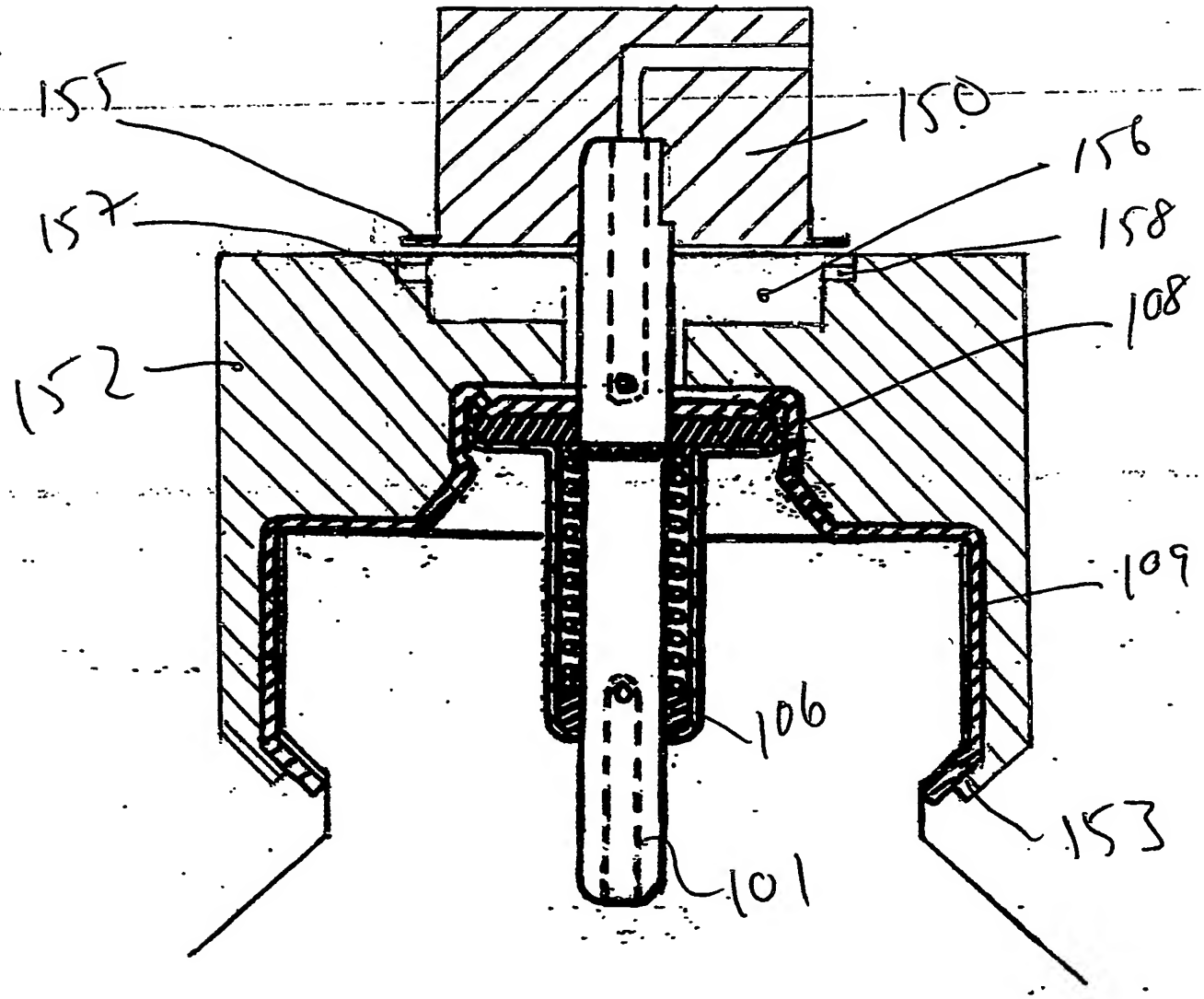

Fig. 4

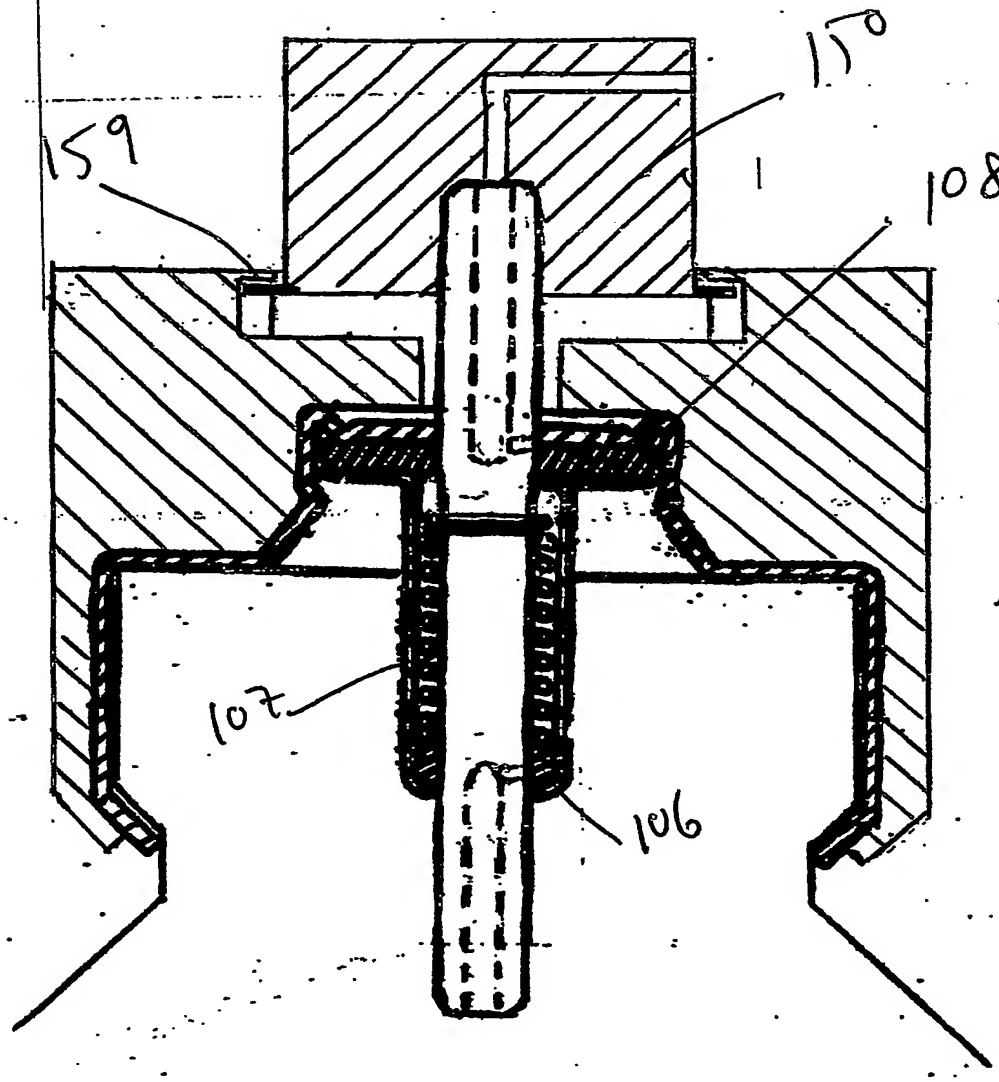

Fig. 5

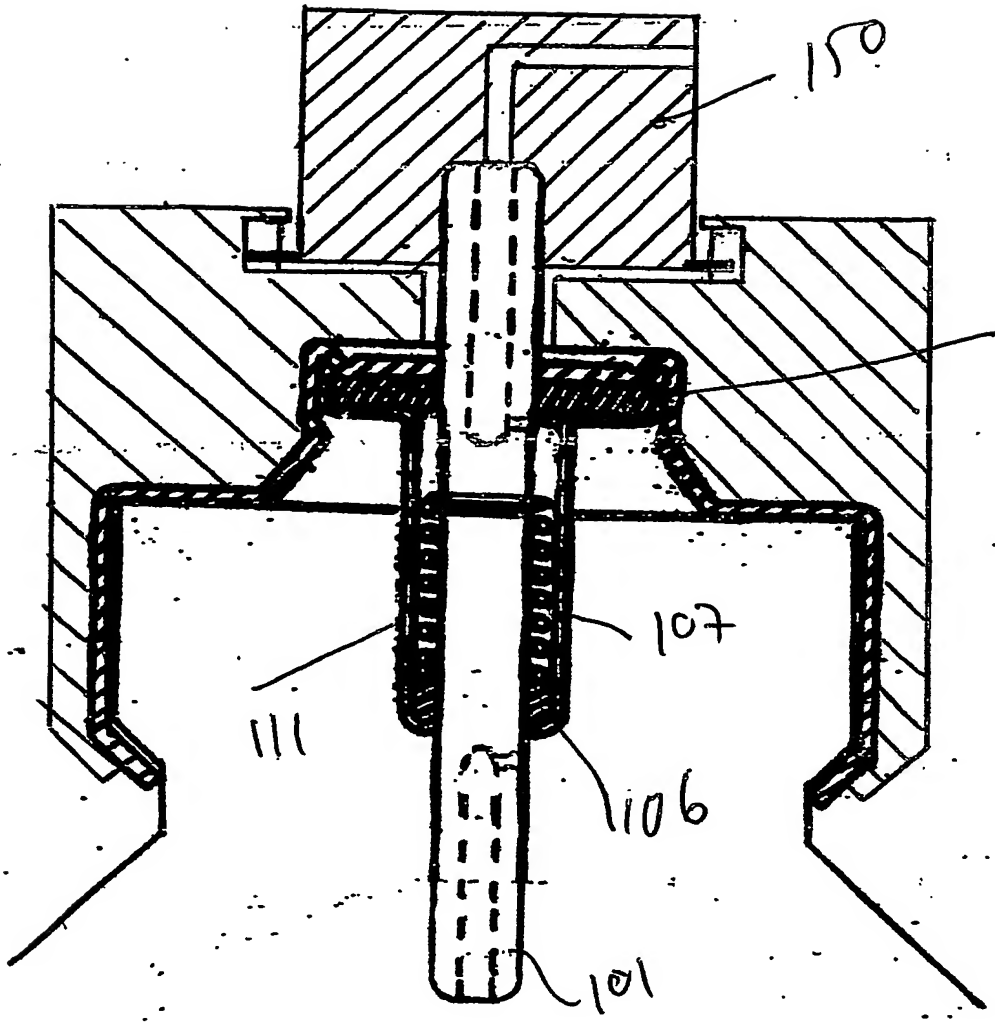

Fig. 6